WHEN ELECTRONICS WAS YOUNG (9)

Wilhelm Conrad Röntgen (1845...1923)

In 1895, the German physicist Wilhelm Conrad Röntgen (1845–1923) accidentally discovered a kind of radiation whose nature he could not determine, and which he therefore called X-rays. He experimented with burst ionization and used for this purpose a screen covered with a thin film of fluorescent material [BaPt(CN)4]. When X-rays were passed through a human onto a photographic plate, the bones were seen as shadowed areas against the lighter flesh, while metal objects, such as a ring, gave opaque shadows. Röntgen later suggested that X-rays were an electromagnetic radiation akin to light but of shorter wavelength, which was proved by von Laue in 1912. Röntgen was awarded the first Nobel Prize in Physics in 1901 for his discovery of X-rays. Their study added much to physics, gave a new technique for use in medicine, and, after the work of the British physicists Sir William Henry Bragg (1862–1942) and his son Sir William Lawrence Bragg (1890–1971) in 1915, led to X-ray crystallography. Sadly, Röntgen died in poverty during the period of high inflation in Germany.

Edison found in 1884 that in an incandescent lamps in which a metal plate was placed opposite the filament a current flowed only if the plate was positive with respect to the filament. Five years later, Sir John Ambrose Fleming (1849–1945) showed that this current consisted of negative charges. In 1987, Sir Joseph John Thomson (1856–1940), while investigating cathode rays (the electrical discharge emitted from an electrode under high fields in a gas at low pressure), concluded that the rays were made up of particles, which were named shortly afterwards ‘electrons’ by the Irish physicist George Johnstone Stoney (1826–1911). Thomson also found that the charge-to-mass ratio (e/m) of these particles did not vary from one cathode material to another. The discovery of the electron was really the beginning of the ‘age of electronics’.

Following on Thomson’s work on cathode rays, the German physicist Karl Ferdinand Braun (1850–1918) modified a cathode ray tube so that its electron beam was deflected by a changing voltage. The resulting cathode-ray oscilloscope has been of inestimable value in electronics and other scientific work and is also the basic component of a television receiver.

As early as 1875, James Maxwell realized the potential possibilities of electromagnetic waves and he predicted wave propagation with a finite velocity, which he showed to be the velocity of light. His theories in the famous A Treatise on Electricity and Magnetism intrigued many researchers such as Heinrich Rudolf Hertz (1857–94), who in 1877 succeeded in producing electromagnetic waves experimentally, thus confirming Maxwell’s predictions.

Guglielmo Marconi (1874–1937), an Italian physicist working in England, was interested in Hertz’s experiments and began experimenting himself in 1895 with a spark induction coil and Branley coherer, and succeeded in sending telegraph messages over a short distance. He patented his invention in 1896 and in 1897 formed the Wireless Telegraph Company (later the Marconi Company) to exploit the patents and to set up the manufacture of spark transmitters and receivers.

Marconi continued to improve his equipment and succeeded in linking England with France by radio in 1899. On on 12 December 1901 he transmitted across the Atlantic from Poldhu in Cornwall to a kite-born antenna set up at St John’s in New Foundland and so became a household word overnight at the age of 27. In 1909, Marconi shared the Nobel Prize for physics with Karl Ferdinand Braun.

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